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# Wartime Food Situation in the Middle East

*by* **AFIF I. TANNOUS***

**Whenever a global conflict takes place, inevitably the Middle East plays a strategic role, largely because of its unique geographical position, bringing into physical contact the three Continents of Asia, Africa, and Europe. Here the East and West have met, and decisive world battles have been fought. During this war, at El 'Alamein in Egypt, at Stalingrad, and in the Caucasus, near the northern borders of Turkey and Iran, the tide of battle was finally turned against the Axis.**

**Perhaps more important than its strategic military position is the role played by the Middle East within the orbit of world economic relations. There are in Iran, Iraq, and Arabia huge reservoirs of oil, only a few of which have been tapped. The region has been developing into an increasingly important market for industrial products of various sorts and, on the other hand, has been able to export substantial quantities of agricultural commodities.**

**As soon as the war broke out, the Allies, in cooperation with the various local authorities, turned their attention to the important matter of food. Their goal was to make the Middle East region self-sufficient in this respect and, if possible, to provide a surplus that could be utilized in deficit areas. As the authorities tried to achieve this end, obstinate difficulties arose, and the food problem increased in complexity. They devised plans, enacted laws, and applied a number of measures in order to check inflationary prices, curb hoarding and speculation, and effect an equitable distribution of supplies, with varying degrees of success.**

## Introduction

The "Middle East," a rather elastic term, is used, for the purpose of this study, to cover the following seven countries: Egypt, Palestine, Trans-Jordan, Lebanon, Syria, Iraq, Iran, and Turkey. Several reasons seem to justify discussing all these countries as one unit. The territory they occupy is contiguous, although it includes a great variety of topographical and climatic features; all have similar methods and techniques of cultivation; in the main, they produce the same crops and raise the same kinds of livestock, yet their agricultural production is sufficiently diversified to make the various parts of the region complementary to one another. There is also striking similarity in the prevailing systems of land tenure, in the general standard of living, and in the dietary habits of the people. Furthermore, each one of these countries is predominantly agricultural in its way of life.

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Of the total population of about 61 million people (of which Turkey has 18 million, Egypt 17 million, and Iran 15 million), about 20 percent are city dwellers, 15 percent are partly settled or nomadic tribes who raise the bulk of the livestock, and 65 percent are village people who cultivate the soil. An estimated 70 percent of all the cultivators work on the land as tenants, sharecroppers, or laborers.

## Pre-War Situation[1]

**Egypt.**—During the relatively normal years preceding the war, Egypt maintained self-sufficiency with respect to most of its foodstuffs—wheat, corn, rice, barley, durra (grain sorghum), legumes, vegetables, fruits, cottonseed oil, and sugar. In addition, it had substantial exportable surpluses of rice, onions, cottonseed oil, and sugar. Some potatoes, nuts, vegetable oil, meat, and dairy products and its total requirements of coffee and tea were imported. Trade in both surplus and deficit food commodities was carried on mainly with neighboring countries of the Middle East and with Italy, France, Germany, and Great Britain.

An important item that had a direct bearing upon Egyptian agricultural production was nitrogenous fertilizer, all of which had to be imported. Also, all of Egypt's modern agricultural machinery was imported, mostly from England, Germany, and the United States.

An outstanding feature of Egyptian agriculture was that it was oriented primarily toward the production of cotton, which was the outstanding cash crop of the country. During the years 1934–38 the cotton acreage averaged 1,843,000 acres, or 22.2 percent of the total cultivated land, as compared with clover, corn, and wheat, which averaged, respectively, 1,452,000 acres, or 17.4 percent; 1,603,000 acres, or 19.2 percent; 1,452,000 acres, or 17.4 percent. Exports of cotton and its derivatives amounted to about 85 percent of the value of total exports.[2]

**Palestine.**—The citrus crop occupied a position in the economic life of Palestine similar to that of the

[1] For a detailed discussion of the pre-war situation see TANNOUS, AFIF I. FOOD PRODUCTION AND CONSUMPTION IN THE MIDDLE EAST and AGRICULTURAL PRODUCTION AND FOOD CONSUMPTION IN IRAN, Foreign Agr. 7 : 243–255, and 8 : 27–42.

[2] See HAZEN, N. WILLIAM. WARTIME ASPECTS OF EGYPTIAN AGRICULTURAL ECONOMY. Foreign Agr. 5 : 217–249. See pp. 220 and 221.

cotton crop in Egypt. In the 1938–39 season, over 15 million cases of citrus (about 660,000 short tons) were exported. The value of these citrus exports accounted for about 75 percent of the value of total exports of the country. Local consumption accounted for about 2.5 million cases. Furthermore, had normal conditions continued, the total crop in the 1940–41 season would have amounted to an estimated 20 million cases.

On the other hand, Palestine imported substantial quantities of nearly all classes of foodstuffs. During the period 1934–38, its average annual imports amounted to about 122,000 short tons of cereals, 17,000 tons of potatoes, 26,000 tons of sugar, and varying quantities of vegetables, fruits, livestock for slaughter, and dairy products.

**Trans-Jordan.**—In contrast to Palestine, Trans-Jordan was a net surplus-producing country at the outbreak of the war. During the period 1934–38 its average annual imports of foodstuffs consisted mainly of 3,000 short tons of rice and 4,000 tons of sugar. Its exports comprised cereals (about 30,000 tons, mostly wheat), grapes, raisins, lentils, fresh vegetables, sheep, and goats, most of which were absorbed by Palestine.

**Syria and Lebanon.**—These two countries were more or less self-sufficient with respect to cereals, having an exportable surplus in some years and a deficit in others. They imported, however, practically all their rice and sugar requirements, which amounted annually to some 20,000 and 35,000 short tons, respectively. On the other hand, they exported substantial quantities of legumes, onions, fruits, and olive oil.

**Iraq.**—Aside from tea and sugar imports, which amounted to some 3,000 and 40,000 short tons, respectively, each year, Iraq was a surplus producer of all essential foodstuffs. On the average, it exported annually over 300,000 short tons of cereals (mainly barley and wheat), 200,000 tons of dates, large numbers of livestock and poultry, and some quantities of dairy products and eggs.

**Iran.**—Prior to the war, Iran was rapidly becoming a surplus producer of staple food commodities, exporting substantial quantities of wheat, barley, and rice (over 80,000 short tons annually), dates, raisins, and almonds. On the other hand, it imported annually some 75,000 short tons of sugar and 7,500 tons of tea.

**Turkey.**—Turkey, essentially an agricultural and pastoral country, was normally self-sufficient with respect to its basic food needs. Important surpluses, which were exported before the outbreak of the war, consisted of wheat (about 3.8 million bushels a year), barley (5.5 million bushels), and substantial quantities of vegetable oil and oilseeds, dried fruits (especially raisins and figs), nuts (especially filberts), livestock, fish, and eggs. All its coffee and tea requirements were imported, as well as some quantities of sugar and rice to supplement local production.

Trade in these foodstuffs was carried on mainly with Germany, Italy, France, and Great Britain. In this trade, Germany was by far the most important and in 1939 secured over 50 percent of Turkey's total exports.

Considering the Middle East region as a whole, a general appraisal of the pre-war food situation may be summarized as follows: (1) With the exception of tea, coffee, and a few luxury items, production was sufficient to meet the needs of the area and leave a substantial exportable surplus of citrus and dried fruits (especially dates, figs, and raisins), rice, onions, nuts, and some quantities of wheat, barley, and vegetable oil. (2) This self-sufficiency was relative, however, to the prevailing standards of living and did not necessarily indicate an adequate diet. In fact, the local diet in general was known to be deficient in meat and dairy products, and it suffered from seasonal shortages of perishable protective foods. (3) At the same time, there was no serious national consciousness of the defective diet prevailing among the peasant masses and the lower urban classes (that is, among the majority of the population). On the other hand, national agricultural policies were directed primarily at the production of several outstanding exportable cash crops as discussed above. (4) With the exception of Egypt, where land had been under intensive cultivation for several decades, at the beginning of the war a wide margin for agricultural improvement was readily apparent in the Middle East, particularly with respect to food production and consumption. The extent of such improvement depended upon the following fundamental factors: (1) More intensive but judicial utilization of farm machinery; (2) extension of irrigation schemes; (3) improvement of livestock breeding and seed selection; (4) greater use of fertilizers and manures; and (5) national programs of pest and disease control.

## Development of Wartime Problems

When World War II broke out early in September 1939, the people of the Middle East were not certain how it was going to affect their destiny, especially as regards the few essential food items

upon which their life depended. They faced the situation as it developed, however, with a definite set of attitudes, policies, and internal organizational patterns, which form a background necessary to the understanding and evaluation of an analysis of the food problem.

In the first place, there was a general feeling that the war was of no immediate concern to them and that they were not going to be affected by it to a serious extent. Whether fully independent, allied with Britain through specific treaties, or directly under British or French influence, the various countries of the Middle East knew that they did not have to participate actively and directly in the armed conflict.

A second general attitude was that by maintaining neutrality they could carry on and intensify their foreign trade with the Allies, with other neutral countries, or with the Axis (in the case of Iran and Turkey). By maintaining normal agricultural production and trade they would be assured of a nearly normal supply of foodstuffs and consumer goods.

In the third place, memories of their experiences during World War I were still fresh. The peasants knew, as did generations of their ancestors who had been ravaged by constantly recurring wars over their strategic territory, that the loss of their cereals, especially wheat, meant certain famine. They were ready, therefore, at the first indication of a bad turn in the situation, to resort to their old and only safe technique of hoarding and secreting as much as they could of their produce. At the same time, the urban masses, who depended entirely for their food upon the maintenance of market supplies at reasonable prices, remembered vividly how they had suffered at the hands of speculators and profiteers. They were afraid that they would have to suffer again if the situation was not controlled effectively. The third group concerned, made up of speculators and profiteers, was ready to repeat its machinations of hoarding available food supplies and then either selling them in open or black markets or smuggling them abroad at high prices.

Another factor in the situation, the importance of which will be indicated later, was the dependency of the Middle East upon foreign sources for most of its consumer goods and its commercial fertilizers. Both these items had a direct bearing upon the quantity and availability of food supplies.

Finally, the internal organization in these countries was not so well developed as to lend itself readily and smoothly to comprehensive schemes of control and regimentation of production, collection, and distribution of food. At the same time, the people were not capable of understanding and complying with complicated regulative measures. In addition, they had inherited a traditional suspicion of any move made by the authorities, especially when these represented a foreign government.

## PRICE INFLATION

Not long after the outbreak of war prices of food commodities began to soar. This inflationary trend continued, practically unchecked and without interruption, during the first 5 years of the war. An analysis of this inflationary trend, unpredecented in the Middle East, reveals several responsible factors. Foremost among them was the huge military expenditures upon varying projects and in payment for supplies purchased locally. Another factor was the competitive preemptive buying by the Allies and the Axis of surplus commodities in neutral Turkey. Enormous sums were spent at inflated price rates, and bank notes in circulation increased as much as from 5 to 8 times the pre-war level.

The situation was further aggravated by the extremely limited supply of consumer goods. Before the war most of these goods were imported from abroad. Shortly after the outbreak of war such imports were either completely halted or reduced to a trickle. Available supplies were soon exhausted or hoarded to be sold on the black market. This in turn contributed to a sharp rise in food prices and a constant demand for increased wages. All these results combined to create a vicious circle that has been partly or completely out of control during the war years. Those who have been hit hardest by this spiral of inflation are the urban lower classes and salaried people. (See table 1.)

## DISRUPTION OF NORMAL BALANCE BETWEEN FOOD PRODUCTION AND SUPPLY

The disruption of the normal balance between food production and supply resulted partly from military demands and operations. Early in the war large numbers of Allied forces were stationed in the various countries of the region, with the exception of Turkey. These forces depended for the principal items of their rations upon imports from their home bases, but they had to procure locally certain perishable foods, such as vegetables, fruits, meat, and dairy products. Moreover, while on leave within the region, members of the armed forces have consumed food at local restaurants and hotels. Thus, a strain on the normal local production and supply was

inevitable. At the same time, the various large-scale construction projects, which had been undertaken for military reasons, drained a large portion of the available labor supply. Consequently, agricultural workers were scarce, which made for hardship, especially at harvesttime.

TABLE 1.—*Indexes of food prices in Iraq, 1941–44*
[1939 prices=100]

| Date | Dates and grains | Meat and dairy | Other foods |
|---|---|---|---|
| March—1941 | 175 | 141 | 153 |
| December—1942 | 710 | 450 | 481 |
| February—1943 | 767 | 624 | 477 |
| April—1943 | 832 | 614 | 474 |
| September—1943 | 777 | 680 | 462 |
| February—1944 | 684 | 849 | 343 |

Official statistics.

In Turkey, strain resulted from the total mobilization which the country adopted within a relatively short time after the outbreak of war. Many agricultural laborers entered the armed forces, adding, at the same time, to the number of people to be fed by those remaining on farms.[3] Furthermore, large numbers of farm draft animals were requisitioned for military purposes.

## TRANSPORTATION DIFFICULTIES

Before the war, the relatively undeveloped means of transportation within the region were more or less adequate to meet the limited local demands. Among and in the neighborhoods of various urban centers within each country, railroads, motor vehicles, and, in some cases, river sailboats served to transport supplies from one locality to another. The bulk of the agricultural production, however, moved from the outlying farms and grazing areas by means of pack animals, especially by donkey and camel.

Soon after the outbreak of war, these transportation lines began to show signs of strain and breakdown. In the first place, the fuel supply of mechanized transport, most of which was imported from abroad, was cut down drastically. The rubber-tire situation became desperate. Replacement, or adequite repair of the rapidly dilapidating stock, came to a virtual standstill, since this depended completely upon imports which were no longer available. Furthermore, pack animals in some countries were conscripted for use by the armed forces, who also held priority over all means of transportation.

## BLACK-MARKET OPERATIONS

Hoarding, speculation, and smuggling offered, perhaps, the greatest obstacles to authorities concerned with solving the food problem. The hoarding of grain, especially wheat, is a deep-rooted traditional practice in the Middle East. For centuries the cultivator of the soil has learned the hard way that he has to take his produce into hiding at the first warning of a natural catastrophe or of war, in order to have a chance for survival. His natural suspicion of governmental authorities becomes especially strong when they attempt to control and requisition his food crops. Consequently, in dealing with this type of hoarding, authorities have had to win the peasant's confidence. Another type of hoarder is the speculator, or the profiteer. He has contributed substantially to the food problem by acquiring great quantities of foodstuffs and consumer goods for smuggling into the black market or across the frontiers, or wherever he could make the greatest profit.

At certain times smuggling across the borders of one country or another reached huge proportions and disrupted carefully calculated plans for collection, distribution, and price control of various essential commodities. This illegal traffic was made possible mainly because of the difficulty of frontier control and the marked differences in free-market, black-market, and official prices from country to country.

## ORGANIZATIONAL DIFFICULTIES

Although normal production was maintained in some cases and substantially increased in others, the needs of the people of the region were not met, and several classes, groups, or sections within each country suffered acutely from one shortage or another. What most of these countries really lacked was a governmental organization that could, without undue difficulty and upheaval, efficiently control and equitably distribute all food and consumer goods.

Instead of that, authorities had, in many cases, nothing upon which to build. With the exception of Egypt and Palestine, there were no adequate statistics showing acreage, yield, and production of the various food crops, to say nothing of general surveys covering potential developments. In some cases, estimates of livestock, which are raised mainly by nomadic groups, were merely gross guesses.

In some areas authorities did not know how much land or how many head of livestock large-scale owners had, or the quantity of crops they produced. (It should be remembered, in this connection, that this group owns the greater part of the agricultural land in the Middle East.) In Iran, for example, up to 1941, all calculations of food production and consumption were based upon official figures submitted

[3] About 80 percent of the Turkish people were engaged in agriculture.

by the various provincial governors. After the deposition of the late Shah, the new governmental authorities denounced these figures as purposely falsified and revised them downward substantially.

Qualified personnel of various sorts was, by and large, lacking. Experts on various aspects of agriculture, field agents, administrators, and executives were far too few to cope with the food problem as it developed and became more and more complex and urgent.

To add to these organizational difficulties, an unsatisfactory political situation prevailed throughout the region (with the exception of Turkey). There was the general problem of how to divide responsibility between local and Allied authorities for carrying out various schemes relative to the emerging food problem—curtailment of cash crops, increase of food production, price fixing, control and distribution of supplies, suppression of hoarding and speculation, and the like.

In Iran, the viewpoints of four different military and civil administrations had to be reconciled. In Palestine the perennial Arab-Zionist conflict asserted itself at every turn made by the authorities in their effort to handle the food problem. In Syria and Lebanon, mandated to pre-war France, the people at first rallied to the Allied side; under the Vichy regime, however, all plans for the collection and distribution of supplies were disrupted and later, under the Free French, were only temporarily improved.

## THE PROBLEM OF DECREASING YIELDS

The countries of the region that had depended heavily upon foreign sources for commercial fertilizers had to find other means of maintaining soil fertility. Egypt was hit hardest in this respect. Its pre-war imports of nitrogenous fertilizers (mostly from Chile, Germany, and Norway) had averaged some 550,000 short tons annually, which were applied generously to some 5,500,000 acres. In addition, the Egyptian cultivators had maintained soil fertility by practicing a well-balanced rotation of crops that was perfectly adapted to the three growing seasons of the year—Nili, Sefi, and Shetwi.[4]

Since the outbreak of war, imports of commercial fertilizers into Egypt have greatly decreased. Also the normal crop rotation has been disrupted because of the urgent demand for cereals. Consequently, the yield of various crops has declined (table 2).

[4] Nili is the season of the Nile flood, during which crops are planted in July–August and harvested in October–November; Sefi is the summer season, beginning in March and ending in November; Shetwi is the season of winter crops, planted in the fall and harvested in the late spring.

TABLE 2.—*Average yields per acre of important food crops in Egypt, 1939–44*

| Crop | 1939 | 1940 | 1941 | 1942 | 1943 | 1944 |
|---|---|---|---|---|---|---|
| | *Bushels* | *Bushels* | *Bushels* | *Bushels* | *Bushels* | *Bushels* |
| Wheat | 33 | 32 | 26 | 28 | 24 | 20 |
| Corn | 37 | 38 | 32 | 28 | 27 | 33 |
| Rice (paddy) | 77 | 62 | 60 | 66 | 50 | 62 |
| Barley | 40 | 40 | 36 | 38 | 33 | 30 |
| Durra (grain sorghum) | 49 | 46 | 54 | 44 | 40 | 40 |

Another factor that has threatened to decrease agricultural production in the region as a whole has been the reduction in imports of modern agricultural machinery and spare parts. Practically none of these could be manufactured locally. At times the need became desperate for tractors and for irrigation equipment.

## THE HUMAN ELEMENT

The element of human behavior, which is an integral aspect of any socioeconomic situation, assumes special importance in adjusting agricultural production and food consumption. In general the agricultural segment of the population is relatively slow to adopt changes in its way of life. This has been especially true of the Middle East, where methods of cultivation and habits of behavior are centuries old, deep-rooted, and emotionally charged. The urban people of that region had also developed a relatively stable food pattern which they were reluctant to change.

The various authorities concerned had, therefore, to contend with this aspect of the problem whenever they tried to apply a new measure relating to the regulation of production, the distribution of supplies, and rationing. In many cases, when the human factor was not taken into serious consideration, partial or complete failure resulted.

In the various urban centers of the Middle East the people had been accustomed to eating wheat bread, and some of them white bread only, which was a sign of good taste that carried prestige. They were reluctant, therefore, to comply with the various measures requiring the adulteration of wheat flour with corn, durra, or barley. In some places the people protested strenuously against receiving rations of bread from Government centers. They wanted flour instead, in order to make their own bread as they had done for generations.

The traditional activity in the Middle East of trading, especially where farmers are concerned, is another case in point which involves much of the personal touch—in the form of haggling about prices, dealing with the same person year after year, indul-

gence in social visiting at the time of transaction, and the exchange of presents and favors. All this, of course, was threatened when the authorities, declaring themselves the sole buyers of certain crops, embarked upon a program of price fixing or commodity rationing. Naturally, the people did not accept such measures happily.

Similarly, the human factor partially accounts for the widespread activities of smuggling and selling in the black market. To be sure, the profit motive was predominant; but, in addition, there was an element of daring, of being able to defy the central authorities, which was manifested especially in the tribal organization of the region. This also denoted resentment against the restrictions placed upon the traditional ways of trading in the region.

## Measures Adopted to Relieve the Food Situation

### REGULATION OF PRICES

For the various reasons already set forth, prices of many commodities in the Middle East started on an inflationary course early in the war period. Each one of the governments concerned resorted to a variety of means in an effort to check this upward trend.

**Prices fixed.**—In 1940 Egypt fixed maximum prices of certain food items; in 1941 the regulation was extended to cereals, flour, and bread, and later to rice and rice flour. Iraq adopted similar regulations with respect to cereals, flour, and bread in 1941, and in the summer of 1943 it fixed the prices of vegetables and fruits. Finally, in February 1944, the High Supply Committee of Iraq was reorganized and then undertook measures to reduce prices of various food items that had been getting out of control. Palestine embarked upon the same line of action in 1940, and in 1942 adopted measures to fix the prices of meals at various classes of restaurants and hotels. The Turkish Government applied ceiling prices to cereals, meat, and cheese in 1941.

**Prices raised.**—In some cases authorities had to increase prices of certain commodities. The Egyptian Supply Committee raised substantially its purchase prices for collected wheat in 1942 and again by about 33.3 percent in 1944. As a result, the Government had to raise the ceiling prices for bread. In the summer of 1942 the Palestine Government raised the price of the imported and controlled flour that it was offering to the public to the level of its purchase price for locally produced wheat. The Turkish Government, which holds a monopoly over sugar, raised prices in 1940 and again in 1941 and 1942, when they reached a level about 15 times as high as that of 1939.[5] The apparent motive was to get extra revenue.

**Prices lowered by controlled imports.**—At the beginning of the war, the Egyptian Government threatened to import wheat from abroad and release it in the open market, in order to force down soaring prices. The Palestine Government went a step further and actually began the importation of Australian wheat in 1940 and later took control of all imported wheat and flour. These imports were distributed to the people at minimum prices. A good portion, however, fell into the hands of speculators, who sold on the black market. The authorities in Syria and Lebanon resorted to the same technique in the fall of 1941. They imported wheat and offered it on the open market at minimum prices. Again the measure failed, for the reason just mentioned.

**Other price-control measures.**—During the summer of 1943 Allied authorities arranged for the sale of gold in certain markets in the region. This resulted in lowering the soaring gold prices and in raising the purchasing value of the note currency. Some reduction in prices was indirectly effected in Syria and Lebanon during the summer of 1944 by reducing the impurity content of grains to zero, requiring the owner to defray transport expenses of his quota to collection centers (long distances being involved in some cases), and reducing the actual prices for any surplus cereals offered for sale after the quota had been collected.

### COLLECTION AND DISTRIBUTION OF FOODSTUFFS

With the normal flow of foodstuffs from production areas to consumption centers disrupted by the outbreak of hostilities, schemes had to be devised by which essential food crops (primarily wheat) could be collected and distributed at reasonable prices where they were needed. In Egypt, after a few preliminary attempts at wheat collection, the Government devised a comprehensive plan for this purpose in the spring of 1942. The target for Government purchase was set at 5.5 million ardebs (about 30 million bushels), which was about 20 percent more than urban needs. The market was to be opened for the disposal by cultivators of further surpluses only after the Government had bought its quota. The country was divided into three zones, according to average yields, and a specific quota per feddan

[5] See the section on inflationary prices above.

(1,038 acres) was assigned to each zone. Early in the season, however, the Government found that the owners were reluctant to surrender their quotas at the prices fixed, since they hoped to sell later at higher prices in the open market. Consequently, the Government modified its plan by declaring itself the sole buyer of the entire wheat crop, after allowing for seed and for the cultivators' needs. The following season a similar scheme was adopted with respect to the corn crop. At one time or another, the Government extended its control measures to other essential food crops.

The Palestine Government began the application of its collection scheme in the summer of 1942. It declared its intention of buying all cereals and sesame over and above the immediate needs of the producers, and purchases were made at fixed prices. Owing to a shortage of meat, which became severe in the spring of 1942, the Government declared itself the sole buyer of animals intended for slaughter. A similar shortage occurred in vegetable oils, and the Government extended its control to the harvesting, pressing, and sale of the important olive-oil crop. In the summer of 1943 the Government announced its policy of putting vegetables and fruits on its list of controlled items for the period September to November of each year, when shortages and high prices normally occur. In 1943 an "Inter-village Redistribution Scheme" was adopted, whereby the movement of wheat from surplus to deficit villages was put under Government supervision.

In Syria and Lebanon, as a result of successive political and military upheavals, the food situation could not be put under proper control until the 1943 harvest. The plan finally adopted was worked out on the principle that the country's need for bread grains should be met from the locally produced crops. To achieve this end, the following measures were decided upon: (1) To make accurate estimates of acreage and production. (2) To collect a certain quota of the crop at the threshing stage. (3) To offer fair prices to the cultivators at a sliding-scale rate—the later the grain surrendered, the lower the price. (4) To assure small cultivators of the good intentions of the authorities—that they were going to have enough left for all their needs and that the sole purpose of the plan was to avoid the possibility of famine in certain parts of the country. (5) To assure big owner-hoarders and speculators of adequate and quick penalties. (6) To make each village responsible collectively for its quota of requisitioned grain. (7) To give the Government a monopoly over the purchase of wheat and other bread grains. (8) To establish strict control over grain movement.

Authorities in Iraq started their collection plans by ordering a census of all wheat stocks in the country to be taken late in 1941. Early in 1942, the Central Supply Committee announced that it was taking full control of the trade, prices, and movement of wheat. In December of the same year, in order to support the collection scheme, the Government ordered the crop tax to be collected in kind. Toward the beginning of 1943, the authorities adopted the plan of buying all available barley at a sliding price, according to the time of delivery. This was intended to induce the owners to bring forth their hoarded supplies. During the 1943–44 season, the collection scheme was based on the requisitioning of 50 percent of the wheat crop, 33 percent of the barley crop, and giving the Government an option on any further surplus offered for sale.

In the fall of 1942, the Iranian Government declared a monopoly over all wheat in the country and forbade its movement from place to place except as authorized by the Government. At the same time the Government purchase prices were raised. In 1943, payments for the wheat collected from farmers were made partly in sugar. The collection scheme devised for the 1944–45 season consisted of the following measures: (1) Landlords could retain not more than 25 percent of their barley and the following proportions of their wheat—up to 365 bushels, 20 percent; 365 to 1,800 bushels, 10 percent; above 1,800 bushels, 5 percent. This was less than they were allowed to retain the previous year. (2) Any peasant whose share amounts to 80 percent or more of the crop must sell to the Government not less than 20 percent of his share. (3) Prices were to be about 10 percent below the previous year's level.

The Turkish Government started its collection plans by requiring everyone in the spring of 1941 to declare all sugar (a Government monopoly) in his possession beyond 10 kilograms (22 pounds). A cereal-requisitioning scheme, adopted and applied in the 1941 and 1942 seasons, did not meet with much success, owing to hoarding, speculation, and disrupted transportation. In 1943 the Government modified its scheme by requiring farmers to surrender graduated portions of their crops, raising substantially its purchase prices, and allowing farmers to dispose of the remainder of their crops on the free market. Shortly thereafter the Government decreed that the new tax on all soil products should be, in the case of most cereals, collected in kind.

All the measures discussed, relating to collection and distribution were concerned indirectly with hoarding and profiteering. In a few cases, however, the authorities took specific measures against these latter activities. Naturally, some countries were

more successful than others in this respect. In Iraq and Iran the struggle was especially hard. The authorities had to introduce one set of regulations after another before they succeeded in inducing or forcing hoarders to declare their stocks, sell to the Government at fixed prices, or face discovery, confiscation, and fines.

The following case of Syria and Lebanon is cited as an illustration of how far the hoarder-speculators went in defying laws and programs. In the fall of 1941, the Allied authorities in charge of the transitional period in these two States "declared war" on the clique of hoarders and profiteers. A plan was devised, including the following main steps: (1) Allocation of sufficient shipping space to bring in wheat from abroad. (2) Distribution of part of this supply among the people to meet urgent needs and consequently cut off the demand on the black market. (3) Offering of the accumulated stock on the open market, free from restrictions and at much reduced prices. (4) Gradual reduction of prices from month to month, which would make it useless for speculators to hoard, and which would force them ultimately to offer their own stocks for sale.

Shortly after the announcement of the plan, wheat shipments began to arrive, and a selling campaign on the free market was launched. The hoarder-speculators struck back by buying off the market, at the Government-reduced prices, most of the wheat that was offered, up to some 50,000 short tons. They added it to their hoarded stocks and were ready for more. Within a few weeks the authorities were forced to give up, and prices soared again. Evidently the authorities had overlooked two big loopholes—the vast capacity of the speculators to buy and hoard and the smuggling across the vast frontiers.

## REGULATION OF FOOD CONSUMPTION

Rationing is alien to the people in the Middle East, especially when agricultural commodities are involved. Since most of them are cultivators of the soil, they have lived mainly upon what they produced, tightening their belts in years of shortage and loosening them in years of abundance. Whatever surpluses they could spare they have bartered for a few essential consumer goods or sold for cash at the neighboring towns. In other words, it is a society still living to a large extent on the simple primary-group level, involving the more or less self-sufficient type of village economy. No wonder, therefore, that the various authorities concerned were reluctant to introduce food-rationing schemes and found them difficult to apply.

A number of regulations concerning food consumption had to be introduced, however, mainly in urban centers. The following are outstanding examples.

On various occasions the Egyptian authorities issued orders specifying the bread formula, changing from time to time the type and quantity of admixture, to be used with wheat. This had to be done because of the unusual demand upon the wheat supply in the country. Early in 1941, the normal flour-extraction rate for cereals was raised substantially and the admixture set at a maximum of 10 percent rice or corn and 90 percent wheat. As the wheat situation became worse, the bread formula was changed to 15 parts of rice flour and 100 parts of wheat flour and shortly thereafter to 25 percent rice, 25 percent corn, and 50 percent wheat. Subsequent modifications were pure wheat only (June 1942), 66.6 percent wheat and 33.3 corn (September 1942), 90 percent wheat and 10 percent barley (May 1943), and 66.6 percent wheat and 33.3 millet (April 1944).

Wheat and flour, or bread, were rationed at one time or another in various urban centers. In Palestine, rationing of flour and bread was started in September 1942. The Iraq authorities first tried to ration flour at special distribution centers in cities. For various reasons this measure did not succeed. They changed to the distribution of brown bread (15 percent barley, 15 percent corn, and 70 percent wheat) at a low price and white bread at a much higher price. This again did not prove satisfactory, and the authorities changed back to the first measure. Bread was rationed in Iran as early as April 1942. Also in Turkey, bread rationing was introduced in January 1942, according to the following daily formula: Children below 7 years of age, 187.5 grams; heavy workers, 750 grams; others, 375 grams.

A meat shortage was felt in practically all urban centers of the region, reaching a critical stage in some places. Syria and Lebanon adopted the measure of observing 3 meatless days a week in 1941. Egypt and Palestine did the same in 1942. Furthermore, animal slaughter was rationed in these two countries, being reduced to a certain percentage of the pre-war level. For example, Jerusalem was allowed 180 head of cattle in 1942 against the normal slaughter rate of 500 head. In June 1944, the Palestine Government started actual rationing of meat to consumers.

Various rationing regulations were applied to sugar (in Palestine, Iraq, Trans-Jordan, Syria, and Lebanon) and to rice (in Syria, Lebanon, and Trans-Jordan). Also other food items were put on the rationing list at one time or another.

After a few years of experience in this line of food control, various authorities in the region have come to the conclusion that rationing by points is best adapted to the more sophisticated urban centers and that, in the simple village communities, straight rationing of commodities should be used.

## ENCOURAGEMENT OF EXPANDED FOOD PRODUCTION

As the demand for food, occasioned by the war, became more urgent from year to year, the traditional pattern of agricultural production in the Middle East had to undergo change and adjustment in three fundamental aspects—more intensive production of the essential grains for which the region has been well known for centuries, a great diversification of food crops, and a curtailment of the nonfood cash crops. In order to achieve these far-reaching objectives, the authorities concerned had to adopt a variety of measures, some of which aimed at encouragement and others at restriction. The following are outstanding examples.

A few years before the outbreak of hostilities, Egypt had embarked upon a policy of increasing food production, especially wheat, in order to cope with the needs of its rapidly increasing population. In 1939 the Government came to the aid of wheat producers by offering them advances at the beginning of the season so that they would not be forced to sell their crop at low prices. In 1940 the Government effected reductions in the land taxes for small cultivators, and in 1941 it started the payment of a bounty for each acre changed from cotton to wheat, barley, or beans. To encourage modern dairy production, the Dairy Farming Council, attached to the Dairy Section in the Ministry of Agriculture, recommended in 1940 that all imported dairy machinery and equipment should be exempted from customs duties.

The battle against the firmly enthroned King Cotton began to bear fruit in 1941, when a law was passed forbidding the raising of this crop on land that was in the previous season planted to certain winter crops. Other restrictive measures followed, and in the 1942 and 1943 seasons the cotton acreage was reduced by over 50 percent of the normal level. Similar reductions took place in the acreage and production of onions. In April 1944 an order was issued requiring food crops to be grown on from 55 to 70 percent of cultivated land in various parts of the country.

Early in 1940 the Palestine Government embarked upon a comprehensive policy of encouraging food production in that deficit country. Loans were made to farmers in order to help them shift to mixed farming, use farm machinery, and develop irrigation projects. Emphasis was put on market gardening and on dairy and poultry production. Between 1942 and 1943 some 10 million vegetable seedlings and close to one million chicks were distributed to cultivators. Rice production was undertaken in the marshy lands of northern Palestine but was soon abandoned because of the prevalence of malaria fever in that area.

Shortly before the outbreak of war, the Government of Iraq had adopted a policy directed toward the extension of cotton production. Under the impact of war, emphasis was shifted to the production of food crops. Consequently, in 1941, all previous regulations that restricted wheat cultivation (with respect to quantity, quality, and locality) were suspended. Furthermore, the Government encouraged certain classes of farmers to maintain their wheat production by issuing to them selected seed and grants-in-aid. Similar aid was given to producers of peanuts (for oil) and of various vegetables.

Under the auspices of the Middle East Supply Center,[6] an extensive potato-production project was undertaken for the whole region partly to meet the needs of the armed forces. The farmers were supplied with good-quality seed, imported from the United Kingdom. Estimates of the total 1944 crop indicate a substantial increase over the pre-war level. The development of potatoes into a major food crop in the future will be primarily conditioned by the availability of appropriate facilities for the storage of seed from season to season. At present the high mountainous sections of the region offer the only natural conditions suitable for storage.

To offset the shortage of commercial fertilizers in Egypt, the Government issued decrees specifying the amount to be used and limiting its application mostly to food crops. As yields decreased, the Middle East Supply authorities became convinced that greater economy could be effected by allowing more shipping space for the importation of fertilizers than by having ultimately a serious grain shortage on their hands.

Consequently, early in 1944 an agreement was reached between the British and Egyptian Governments, whereby the former undertook to supply shipping space for the importation of about 330,000 short tons of nitrogenous fertilizers, or their equivalent, and the latter promised to have that supply used for the increase of food crops. Any surplus production of these was to be sold to the British Government. Recent reports indicate that the amount of fertilizer promised was delivered and distributed to farmers.

[6] This is an extensive Anglo-American organization, with headquarters in Cairo, Egypt, which supervises the supply of food and goods to the peoples of the Middle East. It has been in operation since 1941.

The effect of this measure upon total production of food crops should be apparent in the 1945 harvests.

The Middle East Supply Center undertook to solve the similar problem arising from the shortage of farm machinery and spare parts by assessing the needs of the various countries concerned and then arranging for the shipment of limited quantities of these items from Allied sources. These were distributed where most needed, and their use was put under control.

In addition to these measures, directed toward increased food production, several schemes were adopted to increase the capacity of agricultural production in general, such as irrigation projects. In Egypt, new extensions were added to the Mohammed Ali Barrage, north of Cairo, and opened formally in December 1940. The water level was raised substantially, and more land was given perennial irrigation. By the beginning of 1944, a few projects had been completed in Syria and Lebanon, putting some 30,000 to 50,000 acres under irrigation. Extensive schemes along this line have either been completed or are on the way to completion in Turkey, Iraq, Iran, and Palestine. Local production of simple agricultural machinery and certain fertilizers (especially superphosphate) was undertaken, and a manure plant (to convert refuse to fertilizer) was completed at Beirut, Lebanon. In Turkey, shops were opened in various localities for the repair of farm machinery, the direct cultivation of extensive tracts of new land was undertaken, and from 2.5 to 3.7 million acres of land were distributed to landless or small cultivators.

### SHIFTS IN TRADE POLICY

Soon after the outbreak of war, the normal trade activity in foodstuffs slackened and finally came to a standstill.[7] Consequently, the region as a whole had, so to speak, to shrink into itself and work out internal adjustments. At first each country attempted to shift for itself, regardless of the needs of its neighbors. Gradually, however, as Allied control of the area tightened and the Middle East Supply Center was organized, a wider outlook was developed.

In their earlier attempts at adjustment, the various local governments resorted to many measures with respect to trade in foodstuffs. Most of these may be classified under the following headings: (1) Prohibition of exports, which, in some cases, covered one or a few items and, in others, included all foodstuffs, depending upon local needs and upon available surpluses; (2) restriction of exports, but sometimes permitting exports of certain items on a quota and license basis; (3) conditioned exports, under which permission to export a certain food item was granted when the exporter guaranteed to import some other item of needed food or consumer goods; and (4) exemption of imports from customs duties to facilitate and invite imports of certain essential commodities.

These and similar trade measures, together with others discussed in previous sections, aimed primarily at guaranteeing sufficient supplies for the needs of the people. There were, however, huge surpluses of a few food crops that had to be disposed of in one way or another.[8] The great crop of dates in Iraq has been disposed of through a British company which has had a monopoly on it and through the Middle East Supply Center. Some shipments were sent abroad and others distributed within the region. In a similar manner the Middle East Supply Center arranged for the disposal of the surplus rice crop of Egypt. On the other hand, the large pre-war surplus of Egyptian onions could not be allotted shipping space, and the acreage of that crop had to be reduced drastically, giving place, as did cotton, to other food crops.

The greatest difficulty, however, was encountered in connection with the citrus crop of Palestine. Within a year after the outbreak of hostilities the condition of growers became desperate. Only extremely limited exports of the bulky fruit to foreign markets were possible, and local consumption could not be expanded beyond a small portion of the huge crop. At the same time, other countries within the region had enough of their own citrus or other fresh fruits. Also, as was not true in the case of cotton and onions, the land under citrus could not be utilized for other crops without partially or completely destroying the trees. The authorities could only try to remedy the situation by offering the owners generous loans in order to help them keep the groves in good condition for post-war production.

## Achievement and Outlook

Taking into consideration the large number of elements in the wartime food situation, as analyzed in the previous sections, and looking at the picture as a whole, one can readily see that the three

[7] The main exception to this was Turkey which, until recently, was able to maintain trade relationships with the Axis powers and to benefit from the preemptive buying activity of the Allies. Likewise its substantial food resources could not be utilized directly in the regional plan.

[8] Turkey had no problem in this respect until recently, when it severed diplomatic and economic relations with Germany and had to look for a new market for its surpluses. Its important surpluses of figs, raisins, nuts, and fish were formerly absorbed either by Germany or by the Allies under preemptive buying.

fundamental objectives at which the authorities aimed in attacking the food problem have been the following: (1) To check inflation; (2) to effect equitable distribution of available food supplies; and (3) to maintain or increase production to such an extent that it would meet the essential food needs of the people and, if possible, leave an exportable surplus.

The first objective has been only partially attained. Cost-of-living and food-price indexes (and the exorbitant black-market prices) in the various countries indicate the seriousness of the problem. Yet, had it not been for the various measures undertaken, the situation might have been much more chaotic.

Looking into the future, some of the authorities concerned suggest that the only way through which the interlocked links of the vicious circle—fabulous sums of currency notes in circulation, scarcity of consumer goods, soaring prices for these and for foodstuffs—can be broken satisfactorily is by supplying the people with some of the consumer goods that they desire and need badly. At the same time, shipments of such supplies will not fail to force profiteers to bring into the open some of their hoarded stocks. They also point out that the distribution of such goods should be strictly controlled so that various classes of the population, especially cultivators, can have their equitable share; otherwise the profiteers will not fail to buy the supply off the market and add it to their hoardings.

With regard to the second objective—equitable distribution—the authorities have met with reasonable success. After several years of struggle, involving experimentation in the application of a great variety of measures and learning by trial and error, the indications are that each one of the countries under consideration has succeeded in establishing a reasonably stable central authority to supervise the distribution of essential food commodities at prices more reasonable than if these controls had not been used. More efficient collection schemes are now in operation, with better trained personnel. The authorities have acquired more accurate knowledge regarding acreage, yield, and production of various crops. They are, therefore, in a better position to make assessments for collection from various owners, communities, or regions. At the same time, the average cultivator is less reluctant to part with a certain quota of his produce at the reasonably good price offered by the Government. Furthermore, the various rationing schemes that have been introduced at one time or another are now functioning more smoothly.

Above these various authorities, who are responsible for carrying out the projects locally, stands the Middle East Supply Center, which functions as the central organization for the region as a whole. Among other things, it has succeeded in making the individual countries "region-conscious" in the management of their problems. It has done that through several means, including the holding of conferences on various aspects of agriculture and food, supplying the individual countries with experts in these fields, allotting fertilizer and farm machinery on a regional basis, and pooling the resources of the region for the fight against agricultural pests and diseases. By acting as a clearing agency for the food supplies of the region, the Center succeeded in averting serious shortages in various deficit localities.

The success of the local authorities and of the Middle East Supply Center in the matter of collection and distribution of food supplies, however, is relative. The obstinate problem of the black market is still there and is deeply entrenched. In many cases those who maintain it have proved to be too powerful to be controlled. Many people still have to resort to the black market and pay exorbitant prices for essential commodities, which they cannot obtain through legal channels.

Efforts to attain the third, and perhaps most important, objective—that of maintaining or increasing food production to and beyond the level of self-sufficiency—have apparently met with greater success. In Egypt, there was a relatively small increase in the total area put under cultivation during the war years. On the other hand, a tremendous increase in the acreage of food crops was achieved by cutting down the normal cotton acreage. Against the increase in acreages of food crops, there was a decrease in yields (table 2), due mainly to the lack of fertilizers. Total production of cereals (the most important food crops) has been maintained, however, close to the level of 1939, which was a good year.

The outlook for 1945 was darkened by an unusually short wheat crop in the summer of 1944. Large shipments of wheat into Egypt may, therefore, be necessary, unless greater use is made of other grains, especially the large surplus stock of rice. Furthermore, as a result of the nitrogenous fertilizers that were imported and applied to the soil, higher yields should be obtained in 1945.

In Turkey, the Government continued its policy of putting more land under cultivation and increasing food production. In 1939 and 1940 excellent crops were harvested, and the country was able to meet its needs and have substantial surpluses, some

of which were exported and some used to build up reserve stocks for the army. In the following 2 years (1941 and 1942) the crops were relatively short. Also a severe winter was responsible for the destruction of an unusually large number of livestock. The situation was not desperate, however, and in 1943 and 1944 was fully remedied. Production of the major food crops—cereals, legumes (mainly beans), vegetable oils and oilseeds, fruits, and sugar—ranged from good to excellent. Also livestock reached top condition. Consequently, with two successful harvests to draw upon and with potentialities for increased food production, if necessary, Turkey has reason to face the future with confidence.

In Iran, estimates for the years immediately preceding the war and for the war period indicate a substantial decrease in the acreage and production of wheat, which is by far the most important food crop in that country. Reliable information tends to show, however, that the apparent decrease resulted largely from the adoption in recent years of more accurate statistical methods. A safe assumption is that the normal production of food crops has been about maintained. The severe shortages that occurred in urban centers during 1942 and 1943 were due mainly to various difficulties (related to politics, administration, transportation, and hoarding) that stood in the way of collecting wheat and shifting it from one part of the country to another. The 1944 cereal crops were good in the north (the most important agricultural region of the country), fair in the central part, and poor in the south. Recent reports indicate that the total outturn was sufficient to take care of the country's needs until the 1945 harvests. Looking into the future, Iran can reasonably expect to increase substantially its cultivated acreage and food production. It has vast tracts of lands that can be put under an extended system of irrigation.

Iraq, the fourth major agricultural country of the region, with its rich land irrigated by two great rivers, the Tigris and the Euphrates, has always produced a surplus of foodstuffs, particularly of dates, cereals, and livestock. This surplus production has either been maintained or substantially increased during the war period. Rice production has been increased from an average of 180,000 short tons during 1934–38 to about 320,000 tons. Some decrease in wheat has been more than counterbalanced by an increase in barley, of which there has been a surplus ranging between 200,000 and 300,000 tons a year. Most of this has been made available to neighboring countries, together with substantial shipments of dates and a large number of livestock. Agricultural production can be further increased by making fuller use of the available irrigation water. Iraq is undoubtedly potentially capable of supporting a much larger population than its present 5 million people.

In normal times, Syria and Lebanon, taken together, were able to produce enough of the major foodstuffs to supply the needs of their people. They had to import all their sugar and rice but had some exportable surpluses of barley, grain sorghum, fruits, and olive oil. During the war period, wheat production has been increased by about 88,000 short tons over the 600,000-ton average for the period 1934–38, and the normal production of barley has been practically maintained. On the other hand, the normal wheat needs of both countries are estimated at from 500,000 to 550,000 tons annually. This increase in production has been made possible by putting new areas under cultivation, especially in the northeastern section, called the Jezireh. Reliable estimates indicate that Syria is capable of pushing its food production still higher.

As a result of the unusually rapid increase in Palestine's population within the last three decades, it has become a deficit producer of foodstuffs, despite its increase of total production. During the period 1934–38 some 125,000 short tons of cereals, mostly wheat, were imported and varying quantities of almost all other items of food. On the other hand, as previously mentioned, it exported huge quantities of citrus fruit. During the war period the production of wheat and barley has been increased only slightly, and the country has depended upon fooo imports from the neighboring countries and from abroad and is likely to continue to do so.

The deficit situation in Palestine is partly counterbalanced by the surplus situation in its neighbor, Trans-Jordan. Here cereals and livestock are abundant as compared with the needs of a small population of some 350,000. The surplus situation of the pre-war period has been further improved during the war, mainly by increasing the production of wheat, barley, and lentils.

In addition to the various achievements in food production mentioned in the preceding paragraphs, it should be emphasized that the region as a whole has been aroused to an active consciousness of the importance of vegetables and dairy products in the diet. In practically all the countries under consideration the authorities, in one way or another, have encouraged the cultivation of these items and have succeeded in increasing their production substantially. Out of all the difficulties, failures, and partial successes reviewed in this study, there appears to be promise of further improvement along many lines in the future.

# On Flooding in the Netherlands

*by* **LOUISE E. BUTT** *

**Flooding as a weapon of defensive warfare has been used many times in the history of the Netherlands. Its use in this war was almost a foregone conclusion, first, by the Dutch as a defensive measure and, later, by the Germans. What inundation may have been planned or already carried into effect by the Germans, in anticipation of another Allied offensive in the Netherlands, is not known in reliable detail. There can be no doubt, however, that flooding has been in progress; nor can there be any reason to suppose that the enemy, in mapping his defense, would not make efficient use of this weapon. The food problem for the people of the Netherlands would be critical without the added circumstance of flooding, which is certain to cause a substantial decline in the production of important foodstuffs.**

## The Terrain

In order to understand the possibilities of flooding in the Netherlands, it is necessary to visualize the peculiar terrain of the country. All along its western and northern coast there extends a line of sand dunes, having an average height of some 30 feet, and rising in some places to 200 feet. For the most part these dunes form a full line of defense against the sea, but there are several points at which dikes have had to be built to reinforce them. On the northern coast the dunes have been broken up into a string of islands by the force of the North Sea. These islands must themselves be reinforced by sea walls.

In the lee of the islands the sea is shallow; much of the area between the islands and the mainland is, in fact, not under water at ebb tide. Farther east, the marshy shores of Groningen and Friesland, although slightly above average sea level,[1] have had to be protected from high tides by sea walls extending in an unbroken line from Stavoren to the German border.

The inner circle of shore line around the Ijsselmeer is protected by dikes along all of its western side and much of its eastern side. On the west the land lies below the level of the water, on the east from 0 to 2 feet above it.

The most vulnerable part of the country in some respects is the southwestern corner, where the Zeeland and the Zuidholland islands lie exposed to the heavy channel seas. Of the more than 300 miles of sea coast which these islands have, only some 30 miles have adequate natural protection by the dunes, and the remainder must rely upon dikes. Much of the island area is below average sea level, and the greater part of it is below sea level at high tide.

Finally, the broad belt of river land, through which the Waal, the Lek, and the Maas flow across the southern part of the country, and the narrower Ijssel River district, extending north from Arnhem to the Ijsselmeer, are two regions subject to periodic and, in some parts, to constant flooding. Continual silting has built up the river beds until the streams flow above the level of the land, which is protected only by a continuous line of dikes on both sides of the rivers.

## The Noordholland Peninsula

The lowest land elevations in the country are in the Noordholland Peninsula and the mainland portion of Zuidholland. This is the heart of the "polder," or reclaimed, land, which lies saucerlike between the

FIGURE 1.—Map of the Netherlands.

*Office of Foreign Agricultural Relations.

[1] Altitude is measured in the Netherlands from the mean high-tide mark at Amsterdam, which is referred to as A. P., or "Amsterdamsch Peil."

dunes on the west and the dikes of the Ijsselmeer on the east and rises farther south to the higher ground of Utrecht. Parts of this section are as much as 17 feet, and little, if any, of it is less than 3 feet below sea level. All the land in this area is literally the product of human labor.

In spite of vast improvements in technique, the general principle of "polder" reclamation has remained the same since the beginning of the fifteenth century, when windmill-driven pumps were developed. An area to be drained is first completely encircled by a dike, which isolates it from the surrounding terrain. This enclosed area is called a "polder." Within it a network of canals and ditches forms the drainage system, from which pumps expel the excess water into a drainage canal surrounding the dike. From this canal the accumulated waters must be pumped into a still higher canal or reservoir, which probably also receives the waters of other polders. This process of collecting and lifting the water to higher levels continues until it can be pumped or sluiced into the sea or the tidal rivers. Once the work of reclamation has been accomplished, the pumps and canals continue to be used for the permanent drainage of the land and, in time of drought, for its irrigation. Most of the country's rivers have also been converted into controlled drainage channels similar to canals.

The possibilities of extensive flooding in the extremely low reaches of Noordholland and Zuidholland, by the use of the canal systems that were developed for their drainage, are easily seen. These canals empty into the sea or into the Ijsselmeer at three or four principal points, from which the flooding of wide areas can be controlled.

By keeping the sluice gates at the mouths of the main drainage canals closed and manipulating the drainage system, the water from the polder land could be made to rise in the canals and reservoirs at any point where flooding might be desirable. This, however, would be a slow process. An alternative would be the opening of the sluice gates at high tide, allowing the salt water to flow in and gradually be dispersed over the land served by the canal system. The method that is perhaps most likely to be used, however, because of its simplicity and also because it would cause damage more difficult to repair, would be the destruction of the pumps at strategic points, making subsequent drainage of the land impossible. Since, in the polder area, the ground water level is high and no natural drainage whatever exists, mechanical drainage is a constant necessity. Without it, the first rainfall would cause a rise in the water table, and within a few weeks during the rainy season the land would become unusable for agricultural purposes until after it was drained again.

## The Islands

Land and tide levels in the island group of the southwestern corner of the Netherlands are such that flooding can be accomplished as effectively there as in the lower lying areas of Noordholland and Zuidholland. Most of the coast line of these islands is less than 3 feet above sea level, whereas the normal high-tide level varies between 3 and 6.5 feet and rises during storms to as much as 12 feet above average sea level. The interior of the islands in general is lower than the coast as a result of the slow process of reclamation that has gradually extended the land by building it outward and upward from the old shore lines. Thus a breach in the sea dikes, or the opening of the sluice gates, would endanger areas that lie well inland.

As in the polder land, the low-lying fields on the islands could also be gradually submerged if the drainage pumps were destroyed. Possibly a combination of both methods may be used. Walcheren Island, flooded in the fall of 1944 when one of the main sea dikes was bombed by the Allies in order to drive out the Germans, represents one of the most extreme forms of damage that can be done. Yet even here the rural inhabitants are reported to be determined to remain on the land, in spite of great hardship, and even to have undertaken some cultivation in isolated spots.

## The Ijsselmeer Region

The transformation of the Zuiderzee into an artificial lake, the Ijsselmeer, may be of great importance in any possible flooding of the regions that

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border it. The enclosing of the Zuiderzee was accomplished in 1932 by the completion of the great dam extending from the Noordholland to the Friesland coast. Flooding from the old Zuiderzee would have been limited by the high-tide levels, which varied from 2 to 8 inches around the shores of the bay. The present water level, however, can be raised by as much as 10 feet if the sluice gates are kept shut, and the river waters constantly feeding the lake are thus allowed no outlet to the sea.

The dikes around the shores of the lake probably are not high enough to prevent general inundation at such a water level, and even at considerably lower levels extensive flooding could probably be caused by breaching the dikes at strategic points, or by opening sluice gates at the mouths of the drainage canals. The western shore, and parts of the Friesland coast, where the land lies from 0 to 5 feet below normal water level, would be particularly vulnerable; even the eastern shore, which is no more than 2 feet above the present water level, would not be immune to serious damage.

From the point of view of agriculture, however, the extensive flooding possible from the Ijsselmeer is less serious than the damage which salt-water flooding from the Zuiderzee might have caused. According to official reports, the water of the Ijsselmeer, for agricultural purposes, may be considered fresh.

## The River Districts

The flooding of the low-lying river-marsh areas of the Netherlands can be accomplished most quickly by blowing up sections of the levees that border the rivers on both banks, letting the water flow out over the land. The situation bears a certain resemblance to that in the Adriatic coastal sector of Italy, where sections of the levee along the Fiumi Uniti were blown up as the Germans retreated. The speed of this type of flooding gives it a particular, strategic value. Slow but more methodical flooding can be effected through the use of the many canals that serve to drain the area.

## Preliminary Appraisal of Effects of Flooding on Agriculture

The current extent of flooding in the Netherlands is not a matter of general information outside the country if, indeed, it is known more than locally there. Reports which are received cannot be considered definitive, and conflicting information raises questions as to the reliability of much of the information obtained. The situation is, of course, subject to change from day to day, and estimates made as of any given point of time would have only temporary value. Flooding is, however, known to be in progress, and there can be little doubt that by the time the crop year ends considerably wider areas will have been deliberately flooded, and the "drowning" of low-lying lands that cannot be drained for lack of power to operate the pumps may extend greatly the areas that will be unfit for agricultural production. This type of flooding, which may be invisible long after it has made farming impossible, is probably already widespread.

The regions in which flooding operations may be expected to be carried on are important for the production of sugar beets, wheat, barley, legumes, and rapeseed. Any flooding cannot but have serious effects upon the production of these crops in 1945. A considerable amount of rich pasture land is also to be found in these areas, and dairy production may thus also be expected to decline.

Other factors besides the direct effect of flooding on agricultural production will have adverse effects upon food supplies in the current year. One of the most serious elements in the situation is that of the heavy concentration of population in the area roughly circumscribed by a line running from Haarlem to Amsterdam, to Dordrecht, and to The Hague. Over 2 million urban persons live in this region which normally draws an important part of its food supplies from the area most vulnerable to flooding. The stoppage of rail and canal transportation also cuts off the region from more distant sources of supply. Shortage of power, due to an almost complete lack of fuel, will not only affect drainage but will probably also curtail to a considerable extent the processing of foodstuffs, notably of sugar beets and grain. Military operations may also adversely affect the agricultural and food-supply situation.

How serious may be the results to the Netherlands population is readily seen when the food situation in 1943 and 1944 is considered. In these years, although the food consumption of roughly 20 percent of the people, constituting the farm population, was probably close to pre-war levels, that of the remaining 80 percent of the population, living in urban communities, was only about three-fourths of their prewar caloric intake. Under these circumstances the decline in food production in 1945, which, from present indications, seems unavoidable, will undoubtedly have the most serious consequences, which can only be offset by substantial imports of foodstuffs in 1945 and 1946.

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